

PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

To:

see form PCT/ISA/220

PCT

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY
(PCT Rule 43bis.1)

Date of mailing
(day/month/year) see form PCT/ISA/210 (second sheet)

Applicant's or agent's file reference
see form PCT/ISA/220

FOR FURTHER ACTION
See paragraph 2 below

International application No.
PCT/JP2004/008516

International filing date (day/month/year)
10.06.2004

Priority date (day/month/year)
11.07.2003

International Patent Classification (IPC) or both national classification and IPC
H01L29/739

Applicant
TOYOTA JIDOSHA KABUSHIKI KAISHA

1. This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☒ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☒ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☐ Box No. VII Certain defects in the international application
- ☒ Box No. VIII Certain observations on the international application

2. FURTHER ACTION

If a demand for international preliminary examination is made, this opinion will usually be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA"). However, this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1bis(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of three months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

3. For further details, see notes to Form PCT/ISA/220.

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**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International application No.
PCT/JP2004/008516

Box No. I Basis of the opinion

1. With regard to the **language**, this opinion has been established on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.
 - ☐ This opinion has been established on the basis of a translation from the original language into the following language , which is the language of a translation furnished for the purposes of international search (under Rules 12.3 and 23.1(b)).
2. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application and necessary to the claimed invention, this opinion has been established on the basis of:
 - a. type of material:
 - ☐ a sequence listing
 - ☐ table(s) related to the sequence listing
 - b. format of material:
 - ☐ in written format
 - ☐ in computer readable form
 - c. time of filing/furnishing:
 - ☐ contained in the international application as filed.
 - ☐ filed together with the international application in computer readable form.
 - ☐ furnished subsequently to this Authority for the purposes of search.
3. ☐ In addition, in the case that more than one version or copy of a sequence listing and/or table relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.
4. Additional comments:

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International application No.
PCT/JP2004/008516

Box No. II Priority

1. ☒ The following document has not been furnished:

☒ copy of the earlier application whose priority has been claimed (Rule 43*bis*.1 and 66.7(a)).

☐ translation of the earlier application whose priority has been claimed (Rule 43*bis*.1 and 66.7(b)).

Consequently it has not been possible to consider the validity of the priority claim. This opinion has nevertheless been established on the assumption that the relevant date is the claimed priority date.

2. ☐ This opinion has been established as if no priority had been claimed due to the fact that the priority claim has been found invalid (Rules 43*bis*.1 and 64.1). Thus for the purposes of this opinion, the international filing date indicated above is considered to be the relevant date.

3. Additional observations, if necessary:

Box No. IV Lack of unity of invention

1. ☒ In response to the invitation (Form PCT/ISA/206) to pay additional fees, the applicant has:

☒ paid additional fees.

☐ paid additional fees under protest.

☐ not paid additional fees.

2. ☐ This Authority found that the requirement of unity of invention is not complied with and chose not to invite the applicant to pay additional fees.

3. This Authority considers that the requirement of unity of invention in accordance with Rule 13.1, 13.2 and 13.3 is

☐ complied with

☒ not complied with for the following reasons:

see separate sheet

4. Consequently, this report has been established in respect of the following parts of the international application:

☒ all parts.

☐ the parts relating to claims Nos.

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International application No.
PCT/JP2004/008516

Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes: Claims	
	No: Claims	1-6
Inventive step (IS)	Yes: Claims	
	No: Claims	1-6
Industrial applicability (IA)	Yes: Claims	1-6
	No: Claims	

2. Citations and explanations

see separate sheet

Box No. VIII Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

see separate sheet

Re Item IV

Lack of unity of invention

1. Reference is made to the following document:

D1: US-B-6 452 2281 (HARA KUNIHIKO ET AL) 17 September 2002 (2002-09-17)

2. The application lacks of unity within the meaning of Rule 13.1 PCT for the following reasons.

- 2.1 The common technical features linking the independent claims 1 and 5, each relating to a semiconductor device, are:

- an active device provided in a semiconductor substrate;
- a contact electrode conducting with the active device.

- 2.2 However these common technical features are known from document D1 (see column 16, line 40 - column 17, line 54 and figures 19, 20), which discloses a semiconductor device, comprising:

- an active device provided in a semiconductor substrate (24);
- a contact electrode (32) conducting with the active device.

- 2.3 All the common technical features described here above are consequently known from D1.

Therefore a patentable link between the independent claims 1 and 5 does not longer exist and each of these claims relating to different arrangements of these common technical features must be considered as representative of an invention per se (see Rule 13.2 PCT).

The same reasoning applies between independent claims 3 and 5.

- 2.4 This leads to the definition of the different inventions, not linked by a common inventive concept, as follows:

- Claims 1-4: a device whose surface formed by the common part between the active device and the contact electrode has a particular shape.
- Claims 5-6: a device which has a particular impurity concentration.

2.5 In conclusion, the groups of claims are not linked by common or corresponding special technical features and define two different inventions not linked by a single general inventive concept.

The application, hence does not meet the requirements of unity of invention as defined in Rules 13.1 and 13.2 PCT.

Re Item V

Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement about the first invention (claims 1-4)

1. Reference is made to the following documents:

- D1: US-B-6 452 2281 (HARA KUNIHIKO ET AL) 17 September 2002 (2002-09-17)
- D2: US-A-5 866 931 (ROSSEN REBECCA ET AL) 2 February 1999 (1999-02-02)
- D3: US-A-5 753 942 (SEOK KYUNG-WOOK) 19 May 1998 (1998-05-19)
- D4: EP-A-1 093 168 (SHINDENGEN ELECTRIC MFG COMPAN) 18 April 2001 (2001-04-18)

2. The present application does not meet the criteria of Article 33(1) PCT, because the subject-matter of claims 1-4 is not new in the sense of Article 33(2) PCT.

2.1 The document D1 discloses (see column 16, line 40 - column 17, line 54 and figures 19, 20):

a plurality of vertical DMOS with a contact electrode (32) conducting with the active part of the device, wherein the intermediate insulation film (31) delimiting the surface of contact between the electrode (32) and the active device is an hexagon with six interior angles of 120 degrees.

The subject-matter of claims 1 and 2 is therefore not new.

The subject-matter of claims 1 and 2 is also disclosed in document D2 (see column 6, line 16 - line 40 and figure 6) and in document D3 (see column 5, line 4 - line 27 and figures 5a, 5b).

- 2.2 The document D4 discloses (see paragraphs [116] - [120], [134], [135] and figures 25a, 25b, 31, 32a, 32b):

a plurality of IGBTs comprising a contact electrode (44) conducting with the active part of the device, wherein the shape of the surface of contact between the electrode (44) and the active device has a round form therefore a broader width in an end portion than in a central portion.

The subject-matter of claims 3 and 4 is therefore not new.

Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement about the second invention (claims 5-6)

1. Reference is made to the following documents:

D5: US-B-6 271 5621 (GRAF HEIMO ET AL) 7 August 2001 (2001-08-07)

D6: US-A-6 008 092 (GOULD HERBERT J) 28 December 1999 (1999-12-28)

D7: US-A-5 451 531 (TOMOMATSU YOSHIFUMI ET AL) 19 September 1995 (1995-09-19)

2. The present application does not meet the criteria of Article 33(1) PCT, because the subject-matter of claims 5-6 is not new in the sense of Article 33(2) PCT.

- 2.1 The document D5 discloses (see figure 1, column 6, line 41 - column 9, line 2; the references in parentheses applying to this document):

a plurality of insulated gate bipolar transistors comprising a region (9) located in the

source region (6) and connected with the source electrode (7), this region (9) having a weaker doping concentration than the source region (6).

The subject-matter of claims 5 and 6 is therefore not new.

The subject-matter of claims 5 and 6 is also disclosed by document D6 (see figures 1, 2 and column 3, line 28 - column 6, line 34) and by document D7 (see figure 5 and column 10, line 59 - column 11, line 25).

Re Item VIII

Certain observations on the international application

The application does not meet the requirements of Article 6 PCT, because claims 1, 3 and 5 are not clear.

The expression "conducting portion of the active device and the contact electrode" means the region formed by the active device and the contact electrode because both the electrode and the active device conduct current, although in the description this is the surface formed by the common part between the active device and the contact electrode.

This implies that the subject-matter for which protection is sought may be different to that defined by the description, thereby resulting in lack of clarity (Article 6 PCT) when used to interpret them.

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